

“Var. *d.* Elytris vitta marginali, sutura ad basin maculaque ante apicem nigris.

“Var. *e.* Elytris ad suturam, macula humerali et signatura sublaterali, formam fere literæ X exhibente, nigris.

“Prope accedit ad *D. abruptam*, præcipue var. *d.*, et thorace breviori et sat fortiter bifoveolato, foveolis transversim inter se subconfluentibus, diversa.”

DIABROTICA LACORDAIREI, *Kirsch, Berl. ent. Zeitsch.* xxvii. 1883, Heft ii. p. 199.

“Oblonga, convexa, supra glabra, subtus pubescens, albida; capite, antennis, elytris et metasterno nigris, antennarum articulis duobus antepenultimis et basi ultimi albis; elytris sparse punctatis, maculis quatuor (2, 1, 1, intermedia maxima transversa) eburneis; pedibus nigris, femorum basi albida. (Long. 9–10, lat. $4\frac{1}{2}$ mill.”

“Patria Bogotá.

DIABROTICA JACOBYI, *Kirsch, l. c.* p. 200.

“Oblonga, nitida, glabra, nigra; antennarum articulis duobus penultimis albidis, femoribus posticis abdomineque testaceis, prothorace, mesosterno, femoribus anterioribus elytrisque prasinis, his apice sulfureis, basi fusco bimaculatis. Long. 6, lat. $2\frac{1}{2}$ mill.”

“Patria Nova Granada (Itinere Popayan-Huilda, 1800–2500 M. alt.)”

Owing to the author not having given the relative lengths of the second and third joints of the antennæ, I am unable to place these species in either of the two sections into which I have divided the insects described or enumerated in this paper. *D. Jacobyi* is probably a variety of *D. fusco-maculata*, Jacoby.

Description of *Strongylus Axei* (Cobb.), preceded by Remarks on its Affinities. By T. SPENCER COBBOLD, M.D., F.R.S., F.L.S., Hon. Vice-Pres. Birmingham Nat. Hist. and Microscopical Society.

[Read 21st January, 1886.]

(PLATE XXXII.)

EIGHT years back the late Principal of the Royal Veterinary College, Professor J. B. Simonds, called my attention to a pen-and-ink sketch of a very small parasitic Nematoid. The figure (reproduced below) was accompanied by a MS. note stating that the entozoon was one of several “embryonic worms” found by a student in the mucous membrane of the stomach of a donkey. The

original find was made in November 1864, the student-discoverer being the present well-known authority on comparative pathology, Professor Axe. The sketch itself afforded no indication as to the size of the worm; but it was alleged that the parasites were barely visible to the naked eye, and further that similar microscopic Entozoa had since been procured from the stomach-walls of three more donkeys. Being invited to pronounce offhand upon their nature, I at once remarked that the enlargement at the tail-end, surmounted as it was by a dark line suggestive of the presence of spicules, implied that these so-called "embryonic worms" must be adult male Nematoids. I also added, "The worms are new to science." Further, without waiting for verification, I named the parasite in honour of its discoverer, and published a brief notice of the find in my general treatise ('Parasites,' 1879, p. 383). Subsequently a short description of the parasite appeared in the pages of a professional periodical ('The Veterinarian,' Jan. 1884, p. 6).



Copy of Simond's original drawing.

Priority of discovery in Professor Axe's favour having been thus secured, I have since sought and obtained abundant opportunity of verifying and extending the scanty facts on which the original diagnosis was founded. When occupying the chair of Helminthology at the college, students repeatedly brought me fresh specimens from dissecting-room subjects, the most successful pupil being Mr. Hassall. Apart, however, from all questions of personal interest attaching to its discovery, the parasite is of particular importance not only on account of its small size, but also in respect of its affinity with other gastric and intestinal strongyles. No figure of it has hitherto been published. Its structural characters correspond very closely with those which I described as marking the little entozoon infesting the proventriculus of ostriches (*Strongylus Douglassii*, Cobb.), and, so far as I know, these two species are the smallest of their genus. Then, again, its manifest affinity with the grouse strongyle (*Str. pergracilis*, Cobb.) and with the stomach-worm of lambs (*Str. contortus*) is noteworthy. Quite a variety of maw-worms have recently been discovered; and although there is at present no evidence to prove that donkeys actually suffer from the

presence of maw-worms, yet it is quite certain that other animals do suffer, not excluding the ass's congener, the horse, which not unfrequently develops gastric growths due to *Spiroptera megastoma*. In one case rupture and death ensued.

Apart from all practical considerations, the new parasite from the ass helps to throw light upon questions of morphology. In this connection it may be permitted me to add that the singular maw-worm described by me from the hog (*Simondsia paradoxa*, Cobb.) is by far the most remarkable nematode infesting vertebrates. Since my paper appeared in the Society's 'Transactions' (2nd ser. Zool. vol. ii. part 8) Professor Schneider has, at my request, been good enough to examine two examples, male and female. Whilst correcting me in some particulars of detail, he appears to think that I have even underrated the value and significance of the find both in its morphological and zoological aspects. His conception of a possible rhizocephalous relation, however, would be more readily convincing if there were in *Simondsia* any signs of retrograde metamorphosis, apart from the existence of a large protective "rosette" or sac-covering of the uterine tubes, which, as in *Sacculina*, acts as an organ of anchorage*.

* Prof. Schneider, in a letter to me, says:—"The male *Simondsia* possesses two unequal spicula and four pre-anal papillæ. Accordingly the *Simondsia* would belong to the genus *Filaria*, in my system of Nematoda; and according to Rudolphi's system, to *Spiroptera*. It seems to me, however, to be different from *Spiroptera strongylina*, Rud. (*Filaria strongylina*, mihi), and that it cannot be looked upon in the light of a developmental condition of *Filaria strongylina*.

"The remarkable sac-like protrusion contains (as you have discovered and as I have convinced myself) the chief mass of the sexual organs and an extension of the intestine. I venture, however, to remark that I do not believe the protrusion to be an inversion of the uterus, as it proceeds directly from the skin. It is an outgrowth from the integument, for one can plainly see that the diagonal lines of the skin, which are always present in Nematodes, also pass on to the protrusion (Ausbuchtung), the passage of the body-skin on to the protrusion being everywhere a gradual one. According to my interpretation the vulva lies not in the protrusion itself, but in front of the same. Yet I dare not affirm this with certainty, on account of the difficulty of examining a single example which has been so long preserved.

"The *Simondsia* would thus not connect itself with *Sphærulearia*, but would serve to demonstrate a hitherto unknown and very remarkable modification of the Nematode-body. The importance of your beautiful discovery would be thereby only increased. According to my belief, *Simondsia* exhibits in the embryo and larval condition, and probably also at first in the sexually mature

The following characters distinguish the microscopic maw-worm of the ass:—

STRONGYLUS AXEI (Cobb.).

Body filiform, narrowed in front and behind; *mouth* simple, with short œsophagus and strong chitin layer; *hood* bilobed, with deeply cleft anterior ray and widely separated divisions; trunk of the posterior ray united to its fellow, bifurcate at the end: spicules three, the two larger nearly equal, with a small third or accessory piece intercalated; *tail* of female ending in a post-anal cone, finely pointed; *vulva* within the lower sixth of the body. Length of male nearly $\frac{1}{8}$ " (strictly $\frac{1.5}{100}$ in.); of female $\frac{1}{5}$ " ($\frac{20}{100}$ in.).

Hab. Mucous membrane of the stomach of the ass (*Equus asinus*).

Whilst the extreme transparency of the worm readily permits the ova and other organs to be measured *in situ*, the tubal and ovarian filaments, as well as the corresponding elements in the male, entirely escape observation. The lumen of the œsophagus is clearly traceable, a dark line below it representing the closed pharynx; but I could find no trace of any bulb or other line of separation between the pharynx and the chylous intestine. I suspect the arrangement is the same as obtains in *Strongylus Douglassii*. The mid gut is well marked, as is also the rectum at its anal end.

The pattern of the hood is distinctive, well pronounced, and symmetrical. The widely separated divisions of the anterior ray are thumb-and-finger-like, the upper digitoid being comparatively short and narrow, whilst the lower is closely applied to the succeeding ray, except at the end which is turned upward. The antero-lateral or second ray is paramount and directed downward. The middle, third or lateral, ray proper is of moderate size and deeply cleft into equal halves. The postero-lateral or fourth ray is narrow, straight, and placed well apart. The posterior or fifth ray is narrower, and has the shaft united to its fellow of the

state, the usual nematode form. During its residence in the gastric glands the body-skin grows out, forming the great and the small protrusions which grow into the stomach-glands and serve for the imbibition of nourishment. The relation [thus established] reminds one of the Rhizocephala among the Crustacea."—(Signed) A. SCHNEIDER, Breslau, Oct. 13, 1885.

opposite lobe throughout its upper two thirds, the lower end bifurcating into subequal divisions. If the ray pattern as a whole be compared with that seen in the ostrich strongyle, the affinity of the two species becomes apparent. The general form and disposition of the rays are similar throughout, the most striking difference being that of the cleavage of the posterior ray, which in *Strongylus Douglassii* is three-cleft. It is interesting to observe that whilst all the rays in the ostrich strongyle are relatively stouter than they are in *Strongylus Axei*, they nevertheless individually bear towards each other similar proportions in both species*. Thus the thumb-and-finger-like form of the anterior, the paramount antero-lateral, the moderate-sized middle, the isolated postero-lateral, and the slender posterior rays of *S. Axei* have their counterpart, ray for ray, in *S. Douglassii*. Nevertheless the distinctions already noticed have full specific value apart from those affecting other organs. Quite recently another and larger species of Strongyloid worm (*Sclerostoma struthionis*) has been discovered by Dr. Horst in an Ostrich (*Struthio molybdophanes*). In Horst's entozoon the ray-pattern is altogether unlike either of the above-named species †.

The eggs of *Strongylus Axei* are relatively large, and one can clearly observe the process of yolk-segmentation through the finely-striated integument of the body-wall. The large and conspicuous spicules are ploughshare-shaped, with a tendency towards division of the shaft, the intercalated small spicule being simple and slightly winged at the centre. This accessory piece can only be seen by strongly pressing the cover-glass, or by dissection. In the ostrich strongyle I did not find a third spicule; but I infer that it is present from the general correspondence of the larger organs in both species.

The facts above stated will perhaps be further emphasized by the accompanying approximate measurements:—Head $\frac{1}{1000}$ " to $\frac{1}{750}$ " broad; tail, above the spicules $\frac{1}{250}$ ", at the narrowest part above the anus of the female $\frac{1}{650}$ "; base of the tail-cone $\frac{1}{1000}$ " in breadth, length $\frac{1}{350}$ "; hood $\frac{1}{200}$ " in length by $\frac{1}{80}$ " in breadth; large spicules $\frac{1}{240}$ " and $\frac{1}{230}$ " respectively, accessory piece $\frac{1}{450}$ " in length; eggs $\frac{1}{250}$ " to $\frac{1}{225}$ " in length by an average of $\frac{1}{400}$ " in breadth; distance from the anus to the vulva $\frac{1}{38}$ ".

* Journ. Linn. Soc., Zoology, vol. xvi. plate iv. fig. 3.

† Notes from the Leyden Museum, vol. vii. p. 263.

DESCRIPTION OF PLATE XXXII.

Figs. 1 & 2. Male and female *Strongylus Awei*. $\times 25$ diameters.

Fig. 3. Side view of the tail of the male. $\times 65$ diam.

Fig. 4. Front view of the same. $\times 85$ diam.

Fig. 5. Side view of the lower end of the body of the female. $\times 65$ diam.

Figs. 6, 7, & 8. Head, portion of the body, and tail of the female. $\times 265$ diam.

Fig. 9. Tail and hood of the male. $\times 355$ diam.

Fig. 10. Plan of the hood, with its lobes and rays expanded. $\times 225$ diam.

a, head, and *a*^{*}, mouth; *b*, chitin-lines and lumen; *c*, closed œsophagus; *d*, muscular wall of same; *e*, *e*, chylous intestine or mid gut; *f*, rectum; *g*, anus; *h*, vulva; *i*, upper, and *j*, lower horn of uterus; *k*, *k*, ova; *k*^{*}, chitinous shell; *l*, *l*, cleavage-lines of yolk, and *l*^{*}, *l*^{*}, nuclei of cells; *m*, tail-cone of female; *n*, *n*^{*}, right and left spicules; *o*, accessory piece; *p*, *p*^{*}, right and left hood-lobes; *q*, *q*^{*}, upper and lower divisions of anterior ray; *r*, antero-lateral ray; *s*, *s*^{*}, upper and lower divisions of middle ray; *t*, postero-lateral ray; *u*, bifurcate extremity, and *u*^{*}, trunk of posterior ray; *v*, *v*, transverse striæ of integument.

Note.—All figures were outlined with the aid of a camera; the upper end of fig. 8 being a little out of focus, is a trifle too broad at that part.—T. S. C.

On *Slavina* and *Ophidonais*. By EDWARD C. BOUSFIELD,
L.R.C.P. Lond. (Communicated by Dr. J. MURIE, F.L.S.)

[Read 4th February, 1886.]

(PLATE XXXIII.)

THE recently published 'System und Morphologie der Oligochæten' of Vejdovsky contains many names new to science among the genera and species therein described; and among them the genus *Slavina*, formed to include the *Nais appendiculata* of D'Udekem, and, as identical with it, the *Nais lurida* of Timm. Succinct and clear description of species, adequate for identification, can hardly be said to be the strong point of Vejdovsky's work—possibly he is reserving it for the promised second part; but as in the case of *Slavina* the description is more clear than usual, and several figures are given, there can be little doubt, as I hope to show, that his *Slavina appendiculata* is identical with the species described by D'Udekem, but widely different from that described by Timm.

The species described by Vejdovsky has not come under my notice; but of the *Nais lurida* of Timm I have had many speci-



T.S.C. ad nat. del.

STRONGYLUS AXEI Cobb.

Winter imp.

Carter sc.